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The Petrochemical Industry in the SovBloc

The Soviets' initial interest in petrochemicals was based on the use of non-foodstuffs for making alcohol used in their synthetic rubber industry. In 1946 Stalin pointed out the urgency of this problem, however, it was seven years later before synthetic alcohol was produced commercially by a petrochemical process. In general, the Soviet petrochemical industry today is more than fifteen years behind that of the U.S.

Soviet current interest is principally the rapid expansion of production of textiles, plastics, and other materials based on petroleum sources. These products are basic to their objectives of more and better producers' goods, including defense items, and more consumers' goods. These are the stated goals of the forthcoming Seven Year Plan (1959-1965). While tonnage figures have not been announced, in many cases (as expressed by percentage increases to be made), their objectives appear to be to match U.S. 1957 production. Of the 100 billion rubles to be spent during the period on the chemical industry a substantial part will be devoted to petrochemicals. The types of end-products involved are, in general, those which are in mass production in this country. This is evident from the materials listed in the "shopping lists" under review.

According to a recent statement by the Deputy Minister of the Chemical Industry in 1965 the Soviets plan to use more than 2.5 million tons of liquid hydrocarbons from associated gases to produce chemical products. If, instead

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of these gases, food raw materials were used, it would require expending over 300 million pounds of grain, or 13 million tons of potatoes. Thus the planners expect petrochemicals to become a major industry by 1965.

As to the prospects of their fulfilling these plans, two factors will determine their success. At present the Bloc is short of equipment manufacturing capacity. More serious is the shortage of chemical engineering technology. Past experience has been that except for individual high-priority projects, such as "Sputnik," it normally takes from five to ten years, or even longer, for the Soviets to translate laboratory knowledge into commercial production. Their plans call for rapid expansion in many areas of the chemical industry. Even today, before the plan starts, there are many complaints of construction lags. Equipment deliveries are slow, with the makers blaming the engineers for failure to furnish design data. Many processes used in the USSR chemical industry are deficient in mechanization and automation. The Communists hope to overcome the tremendous increase in skilled workers which their plans will need by the general adoption of modern techniques. Here again, the purchase of the latest U.S. technology, as a part of the plants under discussion, would save thousands of man/years of research and development for the Soviets.

In brief, the Communists have set high goals for themselves and realize that these can be met only with the help of Free World equipment and technology. Their attainment will play a major part in the economic <sup>comprehension</sup> domination of the ~~world which is Khrushchev's announced goal.~~  
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The attached exhibit gives the latest available intelligence information on the status of the various products involved in the plants under consideration.

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Polyethylene and Polypropylene

So far as is known, the USSR is producing only pilot plant quantities of high-pressure polyethylene; production rate being up to 2,500 metric tons per year. Low pressure polyethylene is still in the laboratory stages, but the Soviets claim to be building a plant to produce 15,000 tons a year.

Having vast supplies of raw materials available, the Soviets appear to be planning to make large amounts of these plastics. The numerous references appearing in the Soviet press and technical journals, however, are vague, using such expressions as, "production has been organized," "production will be put into operation," "a plant will be built," etc. The same expressions have appeared for the past several years. In January it was reported that an equipment firm in the USSR would build "a machine for making polyethylene."

A member of the Soviet plastics delegation which visited England in 1957 admitted that the USSR was short of equipment needed for making high-pressure polyethylene. When they were attempting to purchase the technology for making low pressure polyethylene in West Germany, the statement was made that they could pay any price for this information since it would save them five years in getting into production. There have been no reports of a deal being consummated.

As for polypropylene, according to Soviet press reports, production is only in the laboratory stages. In the Bloc countries there usually is a

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considerable lag, normally five to ten years, between laboratory or pilot-plant production and commercial operations. In order for the USSR to be in volume production of these types of plastics it appears necessary for them to purchase both equipment and technology from the West.

#### Caprolactam

In the field of nylons, the Soviets' principal production is the Nylon-6 type, with only very small quantities of Nylon 6/6 being made. Main uses are for tire cord for truck and aircraft tires, and parachute cloth and shroud lines. Since production of both types is limited, estimated at about a total of 8,500 tons in 1955, very little is used for consumer items and apparently molded items are made only for very special applications. Since the raw materials for caprolactam, both benzol and cyclohexane are available in ample amounts, and the technology of manufacture is well established, the Soviets appear to be more interested in expanding Nylon-6 production. A West German firm is reported to be making a tantalum-lined autoclave to be delivered to the USSR for making caprolactam. A goal of 10,000 tons of Nylon-6 tire cord has been announced for 1960.

#### Polyacrylonitrile

The Rumanians were negotiating with Chemstrand Co. for the purchase of a plant and the technology for making "Acrilan," a polyacrylonitrile fiber. The latest information is that Chemstrand has called off the negotiations. The Soviets have been interested for several years in producing this type of

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fiber as a possible substitute for wool and fur garments. Currently they are believed to be making it on a small scale, and plans call for a production of 5,000 tons by 1960. Since the basic raw materials can be made from petrochemical sources, the Soviets have <sup>Ample</sup> unlimited potential supplies <sup>on</sup> which to base production.

#### Polyvinylpyrrolidone

It was announced in 1955 that Soviet researchers had worked out a method for the production of polyvinylpyrrolidone, however, no production has been announced. A West German delegation visiting Moscow in 1957 was reported to have negotiated the sale of a plant to the Russians. There have been no reports on the construction of this plant.

#### Phthalic Anhydride

The technology of the manufacture of phthalic anhydride is well known to the Communists and recently the Soviets have announced that a new process had been developed which would reduce the capital investment needed for making this material from xylene. The latter is presently being obtained from coke chemical sources. (No reference has been seen of making xylene from petroleum.) It would appear that Soviet interest in the US technology is primarily in use of moving-bed catalysis, which would be applicable to other manufacturing processes. There has been no reference to the expansion of phthalic anhydride production as a part of the petrochemical program.

#### Maleic Anhydride

Russian technical literature has made only casual reference to this

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material, and there is no direct evidence that its production is considered to be a high-priority project.

Melamine

East Germany has produced melamine for several years and the Soviets are believed to be producing small amounts on a pilot plant scale only. A large shop for its manufacture is reported to be under construction.

Acrylonitrile

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While the size of the plant mentioned in [REDACTED] letter is quite modest, it is believed that acrylonitrile is one of the materials which the Soviets plan to expand greatly during the next seven years. From their standpoint this is a desirable operation since the technology of production from petroleum sources is well established, and relatively uncomplicated. The acquisition of the latest design information would form the basis for an important petrochemical operation which would provide large amounts of intermediates for plastics, fibers, and synthetic rubber, without drawing on supplies of vitally needed foodstuffs and other raw materials.

Hexamethylene Diamine

To date very little has been published in the USSR on the use of plastic nylon for the manufacture of machine parts, the principal interest in Nylon 6/6 being in the fiber field. Current production is believed to be very small; thus the acquisition of a hexamethylene diamine plant would help Soviets make good on their promises of more consumer goods without adding to the burden on their equipment industry.

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### Acetylene

According to Soviet publications the problem of making acetylene from methane has been under study for some ten years, with little progress being made during that time. So far as is known there is no commercial production in operation. The Wulff process, with the concurrent production of ethylene would have an added attraction to the Soviets' program for establishing a petrochemical industry.

### Ethylene

There have been recent references in the Soviet literature to difficulties being experienced from impure ethylene. These seem to confirm the problems being encountered in getting their petrochemical industry into operation.

### Foam Polyurethane

The Soviets have just recently announced "the mastery of the method for making foam polyurethane." (Since this announcement refers to a laboratory accomplishment), however, it is believed that commercial production will require a considerable period of time, unless they are successful in purchasing the technology and equipment from the West.

### Synthetic Rubber

Until recently the Soviets made only divinyl rubber, from sodium-polymerized butadiene, for all general-purpose applications. The butadiene was produced mainly from fermentation alcohol. Thus their synthetic rubber

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industry constituted a serious drain on their supplies of foodstuffs.

Recent developments consist of producing alcohol from wood hydrolysis and lately from refinery gases. Also a limited amount of rubber is being made as a butadiene/styrene copolymer, similar to our GRS. Lately small amounts of "cold" rubber and oil-extended rubber have been produced. Attempts at making black master-batch synthetic have been noted but this process is not known to be in commercial <sup>use</sup> production. Since divinyl rubber is inferior to GRS, the Soviets are interested in the latest methods for producing the latter.

Further, from the cost data which has been published, Soviet synthetic rubber is much more expensive than natural. There is no doubt that the Communists hope to improve the quality and cost of their synthetic through the acquisition of the latest US technology. Not the least of these factors would be the information gained on automation and instrumentation of this process which knowledge would be transferable to other projects.

There has been nothing seen in the Soviet technical literature on the actual use of synthetic rubber as a binder for missile propellants.

#### Moltopren

The Soviets claim to have three producers of foam sheet, although the raw material used is not stated. ~~On the basis of plastics production, it~~ is probable that the bulk of foam sheet made is from polyvinylchloride. The term "porolon" is similar to both the German and Russian terms for "porous," so it is assumed that "porous moltopren" is meant.

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### Sulphur

While the size of the sulphur extraction plant mentioned is quite small, no doubt the technology involved would be transferable to other processes. The largest oil-producing area in the USSR is the Second Baku Field which yields high-sulphur crudes. It would seem that the Russians would be interested in applying advanced technology used in purifying ethylene to the purification of other petroleum products.

### Carbon Black

The Soviets' primary interest in carbon black is the improvement of their tires, the quality of which is low by US standards. More than half their tire failures are attributed to poor tread quality. For the past several years the Communists have been attempting to improve this deficiency. Supplies of high abrasion black would definitely help. A British industrial mission to the USSR in June 1957 was approached to sell a carbon plant to supply 10,000 tons a year of high abrasion furnace black. One of the objectives of the Sixth Five Year Plan (1956-1960) was to place such a plant in production.

### Di-isocyanates

The Soviets claim to have started the production of foamed polyurethane in 1957. The volume is unstated, but is probably small, since in 1956 the scientists responsible for developing the process were criticized for delaying production by their failure to deliver technical data to the plant. There have been no reports of the production of di-isocyanates being made in the

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USSR, although it is known that the East Germans were conducting research on these materials in 1955.

Titanium Dioxide and Titanium Tetrachloride

Soviet technology in the manufacture of these materials is about on a par with that of the US, although there have been complaints in the Soviet press on the pigment quality of domestic titanium dioxide. Their raw materials supplies are practically unlimited. No strategic advantage can be seen in withholding the export of a plant for making either of these products.

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